



Standard Specification for Chemical-Resistant Carbon Brick¹

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1. Scope

1.1 This specification covers machine made solid uncured carbon brick produced from either metallurgical or petroleum calcined coke, baked to a minimum 1850°F (1010°C), and suitable for use in masonry construction which will be exposed to various chemicals. These units are designed primarily for industries using hydrofluoric acid, fluoride salts, and high concentrations of alkalis such as sodium and potassium hydroxide. Carbon brick are normally used with carbon filled chemical-resistant mortars.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

- C 67 Test Methods for Sampling and Testing Brick and Structural Clay Tile
- C 561 Test Method for Ash in a Graphite Sample
- C 904 Terminology Relating to Chemical-Resistant Non-metallic Materials
- C 1106 Test Methods for Chemical Resistance and Physical Properties of Carbon Brick

¹ This specification is under the jurisdiction of ASTM Committee C03 on Chemical-Resistant Nonmetallic Materials and is the direct responsibility of Subcommittee C03.02 on Monolithics, Grouts and Polymer Concretes.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

TABLE 1 General Guide to Chemical Resistance of Carbon Brick

NOTE—This table is intended for use as a general guide to the resistance of carbon brick in immersion service at ambient temperatures. Specific recommendations should be obtained from the carbon brick manufacturer. Carbon brick can be used to 650°F (340°C). Over 650°F (340°C), strict environmental control is paramount to ensure that the environment is non-oxidizing.

Medium	Chemical Resistance ^A
Nitric Acid, to 40 %	R
Hydrofluoric Acid, to 40 %	R
Blend—25 % Nitric, 10 % Hydrofluoric, 65 % Water	R
Hydrochloric Acid, to 35 %	R
Phosphoric Acid, to 75 %	R
Sulfuric Acid, to 50 %	R
Sodium Hydroxide, to 50 %	R
Potassium Hydroxide, to 50 %	R

^A R = Recommended.

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, see Terminology C 904.

4. Significance and Use

4.1 The chemical-resistant carbon brick meeting this specification is intended for use in acid and alkaline service at varying temperatures. Physical stress imposed on the brick attributable to thermal shock or pressure differential may or may not be a consideration. The corrosion resistance and structural integrity of the brick are dependent on the type and purity of the carbon and binder used when the brick is manufactured.

TABLE 2 Physical and Chemical Requirements

Property	Value
Compressive Strength, psi (MPa), min	6000 (41)
Modulus of Rupture, psi (MPa), min	1500 (10)
Water Absorption, %, max	10
Ash, %, max	8

4.2 The performance of the brick as tested in Test Methods **C 1106** or other tests, or other qualifying data, should be reviewed between the purchaser and the seller.

5. Sampling

5.1 The brick shall be sampled in accordance with Test Methods **C 67**.

6. Chemical Resistance

6.1 Carbon brick are inherently non-wetting and highly resistant to many acids, alkalies, salts, and solvents and combinations of these chemicals at varying temperatures and concentrations.

6.2 The carbon brick shall be tested in accordance with Test Methods **C 1106** using a chemical and thermal environment.

6.3 To comply with this specification, the carbon brick shall exhibit chemical resistance to those chemical media stated in **Table 1** when carried out at ambient temperature in accordance with Test Methods **C 1106**.

7. Physical Properties

7.1 The carbon brick shall comply with the values shown in **Table 2** for compressive strength, modulus of rupture, and water absorption when tested according to Test Methods **C 1106**.

7.2 The carbon brick shall have a maximum ash content of 8% when tested in accordance with Test Method **C 561**.

8. Sizes

8.1 The sizes and tolerances of brick shall be as specified by the purchaser. The measurement of sizes shall be in accordance with Test Method **C 67**, with the maximum permissible variation in dimensions of individual units not exceeding those in **Table 3**.

9. Warpage

9.1 The measurement of the warpage of faces or edges of individual brick shall be in accordance with Test Method **C 67** and the values measured shall not exceed those in **Table 4**.

10. Precision and Bias

10.1 A statement of precision and bias will be added at a later date.

11. Keywords

11.1 alkali resistant; brick; carbon brick; chemical-resistant; thermal shock resistant

TABLE 3 Permissible Variations in Dimensions

Specified Dimensions, in. (mm)	Maximum Permissible Variations in Dimensions Between Largest and Smallest Unit in One Lot ^A , in. (mm)
Up to 2 (50.8), incl.	1/16 (1.6)
Over 2 to 4 (50.8 to 101.6), incl.	1/8 (3.2)
Over 4 to 9 (101.6 to 228.6), incl.	3/16 (4.8)
Over 9 to 12 (228.6 to 304.8), incl.	1/4 (6.4)

^A Unless otherwise determined by agreement between the purchaser and the seller, the size of the lot shall be as per Test Methods **C 67**.

TABLE 4 Permissible Warpage

Maximum Face Dimension, in. (mm)	Maximum Permissible Warpage, in. (mm)
Up to 9 (228.6), incl.	$\frac{1}{16}$ (1.6)
Over 9 to 12 (228.6 to 304.8), incl.	$\frac{3}{32}$ (2.4)

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